

# Evaluation of the Effect of Blue M Active Oxygen Gel and COE-Pack Periodontal Dressing on the Postoperative Surgical Depigmentation Healing

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## ABSTRACT:

### Background:

Gingival hyperpigmentation is a common esthetic condition that can adversely affect smile appearance and patient self-esteem. Scalpel-assisted surgical depigmentation is widely practiced for the management of this condition; however, effective postoperative wound healing is essential to achieve optimal results. Blue M Active Oxygen Gel, owing to its oxygen-releasing and antimicrobial characteristics, has been suggested as a postoperative dressing that may enhance soft tissue repair. The present study was designed to compare the effectiveness of Blue M Active Oxygen Gel and Coe-Pak periodontal dressing on postoperative pain, gingival healing, and re-epithelialization following surgical depigmentation.

### Materials and Methods:

This in vivo comparative clinical study was carried out between April and July 2025 in the Department of Periodontology at Seema Dental College and Hospital. A total of 12 systemically healthy individuals aged 20–55 years presenting with physiologic maxillary gingival pigmentation classified as grades III and IV according to the Dummett–Gupta Oral Pigmentation Index were enrolled. A split-mouth study design was adopted, wherein scalpel depigmentation was performed on both sides of the maxillary gingiva, and the surgical sites were randomly assigned to receive either Coe-Pak periodontal dressing (Group 1) or Blue M Active Oxygen Gel (Group 2). Clinical evaluation was performed at baseline and 2 weeks postoperatively, assessing pain using the Visual Analog Scale

(VAS), gingival wound healing using a healing index, and re-epithelialization using the index proposed by Sridharan and Shankar (2012). Statistical analysis was conducted using SPSS version 21, and a p-value of less than 0.05 was considered statistically significant.

#### Results:

Both treatment groups exhibited significant postoperative improvement at the 2-week evaluation. However, the sites treated with Blue M Active Oxygen Gel demonstrated significantly reduced pain levels, superior gingival healing scores, and more rapid re-epithelialization when compared to those treated with Coe-Pak periodontal dressing.

#### Conclusion:

Within the limitations of the present study, Blue M Active Oxygen Gel proved to be more effective than Coe-Pak periodontal dressing in promoting postoperative comfort, enhancing gingival wound healing, and accelerating re-epithelialization following surgical gingival depigmentation. These findings suggest that Blue M gel may be a favorable alternative for postoperative management in depigmentation procedures..

**Keywords:** Blue M Active Oxygen Gel, Coe-Pak, Gingival depigmentation, Melanin pigmentation, Periodontal dressing, Wound healing.

## Introduction

Gingival pigmentation is a cosmetic problem that cannot be ignored, especially for those with a gummy smile, where a large part of the gingival is seen while smiling (excessive gingival display). This problem limits the possibility of spontaneous smiles for them and results in shyness and loss of self-confidence. Dark pigmentation usually occurs because of excessive melanin deposition in the gingival epithelium. Melanin pigmentation of the gingiva is a physiologic process that occurs in all ethnicities, and its appearance is not an indication of any danger [1].

The colour of the gingiva is one of the most crucial aspects of an attractive smile. The gingival colour varies from one person to another based on physiological or pathological factors which include race, genetics, medications, infections, trauma, smoking, or medical conditions. It could range from coral pink to brown, blue or black. Physiological pigmentation is not a medical condition and

causes no harm to the patient but may cause psychological harm and an unattractive smile especially when coupled with excessive gingival display [2].

Various techniques and methods have been employed to manage gingival hyperpigmentation, including surgical removal with scalpel or, free gingival graft, cryotherapy, electrosurgery, and laser are also used. Although every technique has its advantages and disadvantages, applying the scalpel technique is a conventional approach that is still considered the golden standard as it can be easily performed under local anesthesia. In addition, it is low in cost compared with other techniques and does not need any additional sophisticated equipment [3].

Using periodontal dressings helps in preventing mechanical damage to the wound and maintaining stability at the surgical site throughout the healing process after surgery. Other advantages includes decrease in tooth hypersensitivity in the early postoperative hours,

providing additional comfort as the surgical site heals, providing support in free gingival grafts, preventing post-operative hemorrhage or infection, protecting the clot from pressures generated by speech or mastication, preventing detachment of gingiva from the surface of the root, preventing coronal flap displacement in apically repositioned flaps, and preserving and protecting denuded bone during the process of healing [4].

Coe-Pak is one of the most common periodontal dressings and is used as a standard for comparison with other dressings. Coe Pak is a two-component dressing without eugenol, which also contains bacteriostatic agents. In addition to the common properties of all periodontal dressings, it lacks tissue stimulants, such as eugenol, and has good adhesion properties, adheres well to teeth and soft tissues, and prevents the flap from detaching from the root surface. Despite its widespread use, its disadvantages include poor appearance, indeterminate setting time, and poor flow characteristics during preparation. In addition, its bulky and delicate appearance has always been a problem [5].

BlueM gel has components that release oxygen in addition to antibacterial elements which provides therapeutic effects such as neovascularization, eliminating toxins, aids in the stimulation and synthesis of new blood cells, increases stem cell proliferation which promotes faster healing, and has antihistamine and antimycotic effects [6].

Hence the present study is aimed to evaluate the effectiveness of reactive oxygen gel species BlueM gel and the traditional Coe-Pack dressing on gingival healing and pain after surgical depigmentation.

## Materials & Methods:

### Sources of the data:

**Study design:** This study is an in vivo study.

**Study period:** The study was conducted over 3 months period time from April to July 2025.

### Place of study:

The patients to be studied were selected from the outpatient Department of Periodontology, Seema Dental College & Hospital, Rishikesh, Uttarakhand

### Sample design, method and size:

Sample size estimation was done using nMaster version 2.0

Sample size estimated for Single Mean-Paired t-test.

A minimum total sample size of 12 was found to be sufficient for an alpha error of 5%, power of 80% and 0.47 as effect size (as obtained from the similar article).

### Inclusion criteria:

1. Adults (aged 20 to 55).
2. Patients with physiologic gingival pigmentation.

### Exclusion criteria:

1. Pregnant and lactating women.
2. Medically compromised patients and those with a history of periodontal surgery.
3. Patients with gingival pigmentation associated with other syndromes or lesions.

## Methods of Collection of Data

### Materials

The materials used in the present study included BlueM Active Oxygen Gel and Coe-Pak periodontal dressing.

### Methodology

The study subjects were selected from the outpatient Department of Periodontology, Seema Dental College & Hospital. A total of 12 individuals aged between 20 and 55 years presenting with maxillary physiologic gingival pigmentation classified as Class III or Class IV according to the Dummett–Gupta Oral Pigmentation Index were enrolled in the study.

A split-mouth design was adopted, wherein the maxillary gingiva of each patient was divided

into two symmetrical halves. Baseline clinical photographs were obtained prior to the surgical procedure [Figure 1]. Surgical gingival depigmentation was performed on both halves using the scalpel technique.

Following depigmentation, the two surgical sites were randomly assigned to receive one of the following postoperative dressings:

**Group 1:** Coe-Pak periodontal dressing

**Group 2:** BlueM Active Oxygen Gel

BlueM gel was applied directly over the depigmented gingival surface [Figure 2] using a sterile applicator to ensure uniform coverage [Figure 3]. Coe-Pak dressing was placed over the designated surgical sites, while BlueM gel was applied to the contralateral sites, serving as postoperative periodontal dressings [Figure 4].

Postoperative evaluation was carried out after 2 weeks, and clinical photographs were recorded to assess healing outcomes [Figure 5].

#### Clinical Parameters Assessed

The following clinical parameters were evaluated at baseline and at the 2-week postoperative follow-up:

Assessment of pain using the Visual Analog Scale (VAS)

Healing of gingival tissue using a standardized healing index

Assessment of re-epithelialization acceleration using the Re-epithelialization Index described by Sridharan and Shankar (2012) [7]

#### Statistical Analysis Plan

All collected data were compiled and analyzed using the Statistical Package for Social Sciences (SPSS) software, version 21. Descriptive statistics were used to summarize the study variables, with quantitative data expressed as mean and standard deviation, and qualitative data presented as frequencies and percentages.

Normality of data distribution was assessed prior to inferential analysis to determine the appropriate statistical tests. Within-group comparisons between baseline and the 2-week postoperative period were performed using the paired t-test for normally distributed data and the Wilcoxon signed-rank test for non-normally distributed data. Between-group comparisons of postoperative outcomes between the Coe-Pak group and the BlueM gel group were conducted using the independent t-test for normally distributed variables and the Mann–Whitney U test for non-normally distributed variables.

All statistical analyses were two-tailed, and a p-value < 0.05 was considered statistically significant. Graphical representations of the results were prepared using Microsoft Excel to illustrate intergroup differences in pain, gingival healing, and re-epithelialization following surgical gingival depigmentation.



**Figure 1:** Pre-Operative Before Surgical Depigmentation



**Figure 2:** Blue M Gel



**Figure 3:** Application Of Blue M Gel With A Help Of An Applicator



**Figure 4:** Application Of Coe-Pack And Blue M Gel As Periodontal Dressings After Surgical Depigmentation



**Figure 5:** Post-Operative After 2 Weeks

**Results:**

[Table 1] and [Figure 6] present the postoperative pain outcomes measured using theVAS at baseline and at the 2-week follow-up following surgical gingival depigmentation. A significant reduction in pain levels was observed in both groups over the follow-up period. However, participants treated with Blue M Active Oxygen Gel (Group 2) reported substantially lower pain scores compared with those treated with Coe-Pak (Group 1), indicating improved postoperative comfort. The intergroup difference was statistically significant, demonstrating the enhanced pain-relieving effect associated with Blue M gel.

**Table 1:** Pain Assessment (VAS Score)

| Group                                 | Baseline  | 2 Weeks   | p-value |
|---------------------------------------|-----------|-----------|---------|
| Group 1<br>(Coe-Pak)                  | 8.0 ± 0.0 | 2.1 ± 0.7 | <0.001  |
| Group 2<br>(Blue M Active Oxygen Gel) | 8.0 ± 0.0 | 0.8 ± 0.5 | <0.001  |

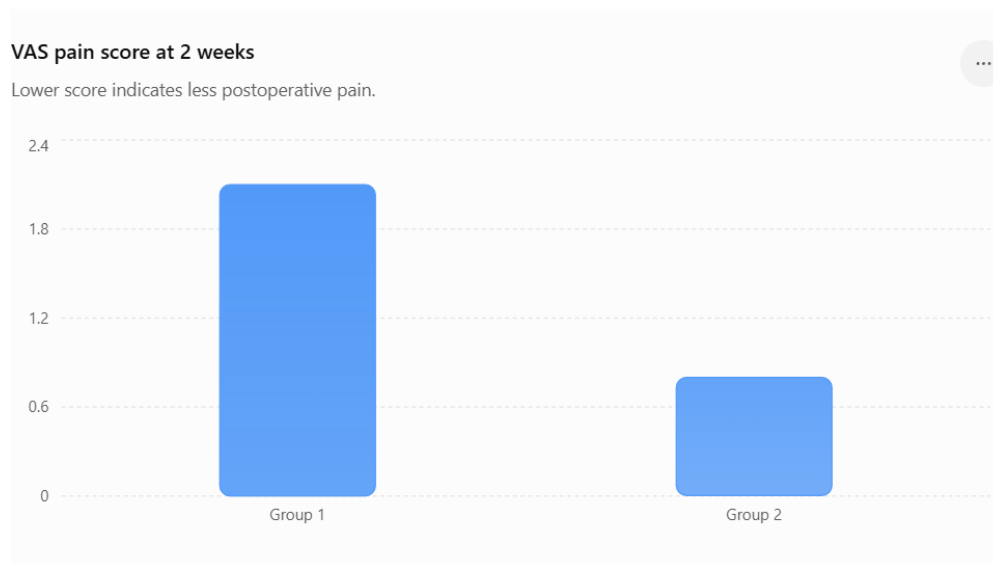


**Figure 6:** The graph shows that both groups experienced a reduction in postoperative pain after 2 weeks. However, Group 2 (BlueM gel) exhibited a markedly lower VAS score than Group 1 (Coe-Pak), indicating significantly better pain control and patient comfort.

[Table 2] and [Figure 7] illustrate the changes in gingival tissue healing, assessed using the gingival healing index, at baseline and at 2 weeks postoperatively. Both groups exhibited marked improvement in healing by the end of the study period. Nevertheless, Group 2 achieved

significantly higher healing scores than Group 1, reflecting better soft tissue response, reduced inflammatory signs, and more advanced wound maturation at sites where Blue M Active Oxygen Gel was applied.

**Table 2:** Gingival Healing Index

| Group                   | Baseline | 2 Weeks       | p-value |
|-------------------------|----------|---------------|---------|
| Group 1<br>(Coe-Pak)    | 0        | $4.1 \pm 0.4$ | 0.002   |
| Group 2<br>(Blue M Gel) | 0        | $4.8 \pm 0.3$ | <0.001  |

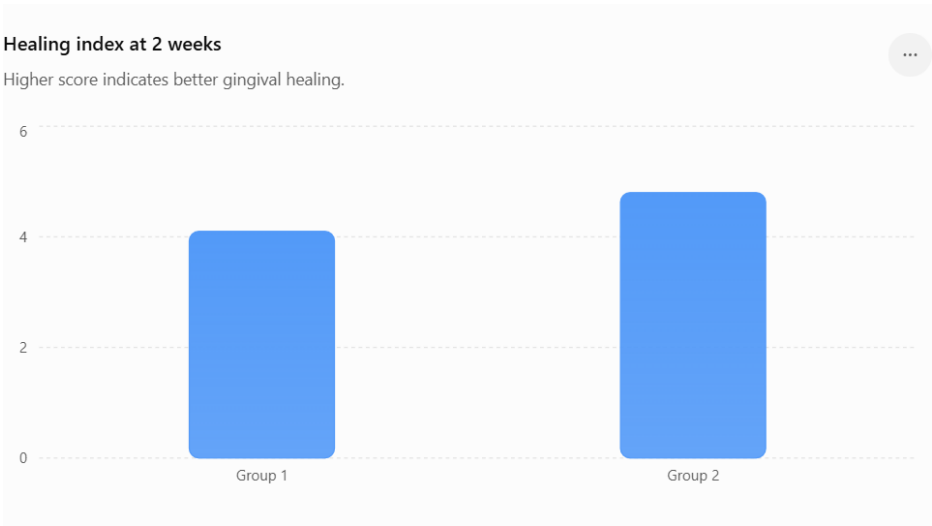


**Figure 7:** The graph demonstrates improved healing in both groups at 2 weeks. Group 2 showed a higher healing index than Group 1, suggesting superior gingival tissue healing, reduced inflammation, and better wound maturation with BlueM gel.

[Table 3] and [Figure 8] summarize the findings related to re-epithelialization, evaluated at baseline and at 2 weeks after surgery using the re-epithelialization index. Although epithelial coverage was absent at baseline in both groups, progressive epithelial regeneration was noted at

the 2-week assessment. Sites managed with Blue M Active Oxygen Gel demonstrated superior re-epithelialization scores compared with those treated with Coe-Pak, indicating faster epithelial repair and more efficient wound closure with the use of Blue M gel.

**Table 3:** Re-epithelialization Index

| Group                   | Baseline | 2 Weeks   | p-value |
|-------------------------|----------|-----------|---------|
| Group 1<br>(Coe-Pak)    | 0        | 2.5 ± 0.3 | 0.004   |
| Group 2<br>(Blue M Gel) | 0        | 3.0 ± 0.0 | <0.001  |

**Re-epithelialization at 2 weeks**

Higher score indicates better epithelial coverage.

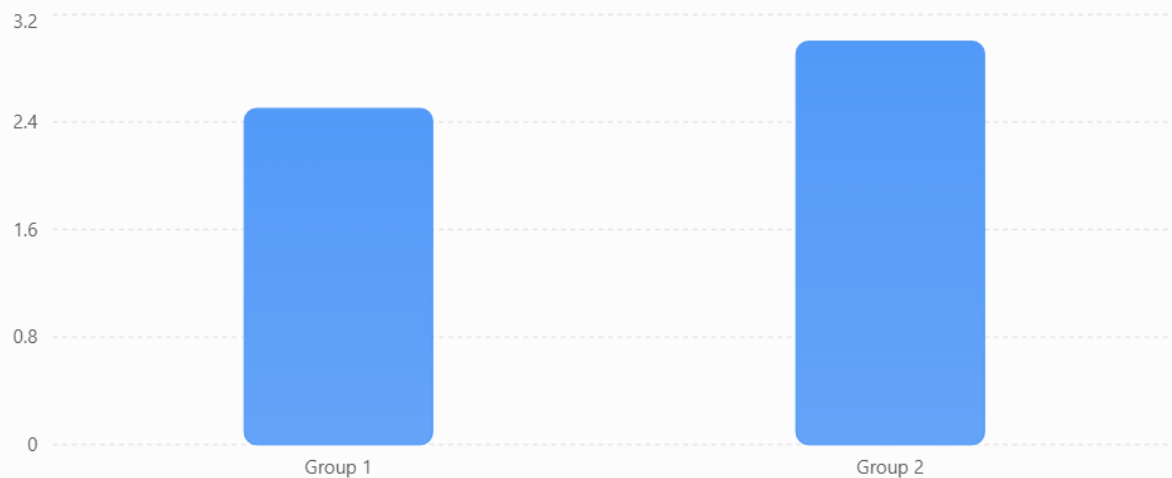


**Figure 8:** The graph indicates faster re-epithelialization in Group 2 compared with Group 1. The higher score in the BlueM gel group suggests accelerated epithelial coverage and improved wound closure at the surgical site.

**Discussion:**

Gingival hyperpigmentation is a common esthetic concern, and surgical depigmentation remains one of the most reliable and effective modalities for its management. However, the long-term success of this procedure is closely related to the quality of postoperative wound healing and the level of patient comfort achieved during recovery. The present study evaluated and compared the healing outcomes following surgical gingival depigmentation using Blue M Active Oxygen Gel and Coe-Pak periodontal dressing.

Earlier clinical investigations have emphasized the importance of postoperative wound protection in periodontal surgery. Sadighi et al. [8] demonstrated that appropriate periodontal dressings can significantly reduce postoperative pain and enhance wound healing following flap surgery. Similarly, Reda et al. [9] reported reduced postoperative discomfort when biologically active materials were used after surgical gingival depigmentation, highlighting the role of adjunctive wound-care agents in improving patient outcomes.

More recent split-mouth clinical studies have directly compared Blue M Active Oxygen Gel with conventional periodontal dressings. Garg et al. [10] reported superior healing response and improved patient comfort at sites treated with Blue M gel when compared with Coe-Pak. Comparable findings were also documented by Garg et al. [11], who observed better pain control and faster wound healing with Blue M gel, supporting its clinical effectiveness as a postoperative dressing.

The biological rationale for improved healing with Blue M Active Oxygen Gel lies in its oxygen-releasing properties. Adequate oxygen availability is essential for cellular metabolism, collagen synthesis, angiogenesis, and epithelial migration during wound healing. Enhanced oxygenation also supports host defense mechanisms and reduces inflammatory responses. These biological processes collectively contribute to faster epithelialization and improved soft tissue regeneration, as reflected in the present study findings.

The understanding of gingival pigmentation itself is rooted in the foundational work of

Dummett [12] and Dummett and Gupta [13], who described the physiological and epidemiological aspects of oral pigmentation. Their work provides the basis for identifying physiologic gingival pigmentation and selecting appropriate treatment approaches. Karydis et al. [14] further discussed clinical strategies for managing oral melanin pigmentation, reinforcing the role of surgical depigmentation as an effective therapeutic option.

Although various depigmentation techniques have been explored, including laser-assisted approaches, the scalpel technique remains widely used due to its simplicity and cost-effectiveness. Suragimath et al. [15] compared scalpel and diode laser depigmentation techniques and emphasized that postoperative healing and patient comfort are critical determinants of clinical success, irrespective of the surgical method employed.

Coe-Pak periodontal dressing has traditionally been used following periodontal surgery because of its ability to protect the surgical site from mechanical irritation and maintain wound stability. Rubinoff et al. [16] described the physical properties of periodontal dressings and emphasized their primarily passive role in wound protection rather than direct stimulation of biological healing processes. This limitation may explain the comparatively slower healing response observed with Coe-Pak in the present study.

In contrast, Blue M Active Oxygen Gel provides an active biological approach to wound management. The importance of connective tissue response and cellular activity in periodontal healing has been highlighted by Embery et al. [17], supporting the concept that biologically active agents can positively influence the healing cascade. The superior outcomes observed in the Blue M group in the present study—including reduced pain, enhanced gingival healing, and faster re-epithelialization—are consistent with these biological principles.

Overall, the findings of this study suggest that Blue M Active Oxygen Gel offers clear

advantages over conventional Coe-Pak dressing in postoperative management following surgical gingival depigmentation. Its ability to actively promote healing, minimize inflammation, and improve patient comfort makes it a promising alternative to traditional periodontal dressings. Nevertheless, further well-designed studies with larger sample sizes, extended follow-up periods, and histological evaluation are recommended to substantiate these results and develop standardized clinical guidelines.

#### **Limitations:**

The findings of this study should be interpreted in light of certain limitations. The relatively small sample size of 12 participants reduces the statistical strength of the study and limits the extent to which the results can be generalized. Furthermore, the follow-up period was limited to 2 weeks, which did not allow assessment of long-term healing, recurrence of gingival pigmentation, or sustained patient comfort. Being a single-center study, the generalizability of the outcomes may also be constrained. Inclusion was restricted to adults aged 20–55 years with physiologic gingival pigmentation, which limits the applicability of the results to other age groups and to pigmentation related to systemic conditions or syndromes. Only scalpel surgical depigmentation was evaluated, without comparison to alternative modalities such as laser therapy, electrosurgery, or cryosurgery. In addition, the possibility of operator and assessment bias cannot be excluded, as the same clinician performed the procedures and evaluated the outcomes, particularly those based on subjective measures. The use of subjective clinical indices, including the VAS and healing indices, may further introduce variability due to individual patient perception and examiner interpretation. Lastly, the absence of histological analysis restricted detailed evaluation of tissue healing and re-epithelialization, and patient-reported outcomes beyond pain, such as esthetic satisfaction and quality of life, were not assessed.

## Conclusion:

Within the limitations of the study, both Blue M Active Oxygen Gel and Coe-Pak periodontal dressing were effective in supporting postoperative healing following surgical gingival depigmentation. However, the Blue M Active Oxygen Gel group demonstrated improved healing outcomes, characterized by enhanced tissue repair, reduced postoperative discomfort, and better patient acceptance compared with

Coe-Pak periodontal dressing. The oxygen-releasing properties of Blue M gel may contribute to accelerated wound healing and improved postoperative recovery. Therefore, Blue M Active Oxygen Gel can be considered promising alternative to conventional periodontal dressings for the management of surgical depigmentation wounds. Further studies with larger sample sizes and longer follow-up periods are recommended to confirm these findings.

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